APPENDIX D

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF STAFF
WASHINGTON, DC 20310-4200

REPLY TO
ATTENTION OF

DACS-SF 11 April 1994

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Use of Commercially Available Chemical Protective Clothing

1. In order to comply with federal, Department of Defense and Army safety standards, the Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health) has authorized the Director of Army Safety to develop a program to allow the use of commercially available chemical protective clothing during toxic chemical operations. This action was in response to a request from the U.S. Army Materiel Command, which highlighted the need to expand the Army inventory of available protective clothing and comply with Occupational Safety and Health Administration (OSHA) requirements.

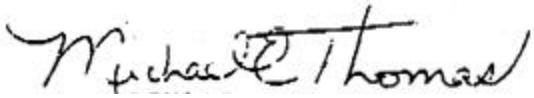
2. The enclosed matrix, developed by technical experts from the Edgewood Research, Development and Engineering Center (ERDEC) and the Chemical Materiel Destruction Agency identifies the testing necessary to allow the use of commercially available protective clothing in toxic chemical operations. The matrix requires specific testing and the development of a "use scenario." Once completed, the test data and "use scenario" must be submitted to Chief of Staff ' ATTN: DACS-SF, 200 Army Pentagon, Washington, DC 20310-0200 for final review and approval.

3. One key feature of the test matrix is that the commercial protective clothing need not pass each testing requirement, but only those requirements identified as essential under the "use scenario." A protective suit, for example, need not pass the National Fire Protection Association flammability resistance test if the suit is not used in a flammable area.

4. This policy does not prevent the use of existing. Army chemical protective clothing. Rather, the use of commercially available protective clothing is intended to give Army employees, contractors and others involved in toxic chemical operations more options to address the wide mix of chemical hazards which exist both on and off Army installations. This initiative will allow users to tailor their requirements and select the best available chemical protective clothing.

5. In order to prevent duplication of approval testing, ERDEC will maintain a file of commercially available clothing test results. Before testing, users should contact the Director, ERDEC, ATTN: SCERD-ODR-S, Aberdeen Proving Ground, MD 21010-5423 to determine what testing has been done, or if a commercially available product has already completed testing.

6. This action was coordinated with the Deputy Chief of Staff for Operations and Plans, the Deputy Chief of Staff for Logistics, the Judge Advocate General and The Surgeon General. The point of contact for the Army Safety Office is Mr. Cliff Dunseth, ATTN: DACS-SF, (703) 695-7291 or DSK 225-7291.



Encl

MICHAEL E. THOMAS
Colonel, GS
Deputy Director of
Army Safety

DISTRIBUTION:

Commander, U.S. Army Materiel Command, ATTN: AMCSF/AMCCE/AMCSG, Alexandria, VA 22333-0001

Commander, U.S. Army Forces Command, ATTN: FCJ1-SO/FCG3-OC, Fort McPherson, GA 30330-6000

Commander, U.S. Army Training and Doctrine Command, ATTN: ATOS, Fort Monroe, VA 23651-5000

Commander, U.S. Army, Pacific, ATTN: APPE-SA, Fort Shafter, HI 96858-5100

Commander, U.S. Army Corps of Engineers, ATTN: CESO/CEMP-R, 20 Massachusetts Avenue NW, Washington., DC 20314-1000

Commander, U.S. Army Chemical Materiel Destruction Agency, ATTN: SFIL-CMS, Aberdeen Proving Ground, MD 21010-5001

Commander, U.S. Army Medical Research and Development Command, ATTN: SGRD-RML-S, Frederick, 21702-5012

Commander, U.S. Army Nuclear and Chemical Agency, ATTN: MONA-CM, 7150 Heller Loop, Suite 101, Springfield, VA 22150- 3198

Director, Edgewood Research, Development, and Engineering Center, ATTN: SCBRD-ODR-S Aberdeen Proving Ground, MD 21010-S423

Director, U.S. Army Technical Center for Explosives Safety, ATTN: SMCAC-SE, Savanna, IL 61074-9639

CF: (w/o encl)
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USAMC CHEMICAL AGE NT SAFETY & HEALTH POLICY ACTION COMMITTEE

(CASHPAC)

PROTECTIVE CLOTHING TEST MATRIX PROPOSAL

22 NOVEMBER 1993

COMMERCIAL CHEMICAL PROTECT CLOTHING TEST MATRIX

Commercial chemical protective clothing must he tested against the following mandatory requirements:

NFPA 1991
OSHA 1910.120
Swatch Test
Man-In-Simulant Test
Decontaminability

The choice of appropriate chemical protective *clothing is based on* many factors to include the "use scenario". A detailed description of how and where the suit will be worn must first be developed. The clothing will then be tested against the requirements. Some of the mandatory tests may be optional depending on the scenario i.e., if clothing will not be reused then decontaminability testing may not be required. Also, if - a suit f ails a test or a portion of a test this does not mean that the suit has failed as a whole if the use scenario allows for the failure. For example, a suit fails the flammability resistance test (NFPA 1991). Approval to use the suit may still be granted *with* the contingency that it is not used in a flammable area.

Test Descriptions:

Chemical Protection –

NFPA 1991 – (new and abrasion conditioned)
- Overall Suite Water Penetration Test
- Chemical Permeation Resistance Test
- Flammability Resistance Test
- Abrasion Resistance Test
- Cold Temperature Performance Test
- Penetration Resistance Test
- Exhaust Valve Inward Leakage Test
- Exhaust Valve Cracking Pressure Test
- Luminous Transmittance Test

Swatch Tests (Worn & Unworn) - TOP 8-2-501
- (1) Wear Testing
- (2) Swatch/Component Testing (HD, GB, VX, L @ 12 g/m^2)

OSHA 1910.120 –
- Totally-Encapsulating Chemical Protective Suit Press Test
- Totally-Encapsulating Chemical Protective Suit Qualitative Leak Test

Reuse after Vapor Contamination (Decontaminability: reuse after exposure to vapor)

Man-In-Simulant

Other Considerations:

Microclimatic Cooling (does heat stress management provided meet mission)

Environment –
- Electromagnetic – MIL-STD-461
- Hot and Cold – (range of 0 to 100^oF)

Human Factors -

Donned/doffed with one assistant
Compatibility with IMHE, tools, equipment
Anthropometric data
Compatible with existing communications equipment

Breathing Capability -

NIOSH approved SCBA

Detailed Description of Tests:

A. NFPA 1991, Standard an Vapor-Protective Suits for Hazardous Chemical Emergencies

NFPA 1991 addresses vapor -protective suits designed to protect emergency response personnel against exposure to specified chemicals in vapor and liquid splash environments during hazardous chemical emergencies. The NFPS 1991 battery of chemicals are specified in ASTM F 1001. The standard includes performance requirements that were established to reflect simulated use conditions.

- A suit pressurization test is used to check the air-tight integrity of each suit.
- An overall suit water penetration test is designed to ensure the suit provides full body protection against liquid splashes.
- Primary materials must resist permeation for one hour or more by each chemical
- Also included are penetration resistance testing of closures, and leak and cracking pressure tests for exhaust valves.
- Material testing for burst strength, tear strength, abrasion resistance, flammability resistance, cold temperature performance, and flexural fatigue are required so that materials used for vapor-protective suits will afford adequate protection in the environment where they will be used.

1. Overall Suit Water Penetration Test

Each vapor-protective suit will meet the "pass" requirements of *ASTM F 1052, Practice for Pressure Testing Of Gas-Tight Totally Encapsulated Chemical Protective Suits.* Test scenerio: A, *human* form mannequin (water resistant) dressed in suit with an inner garment covering all areas of the mannequin as an aid to observe water penetration. Five nozzles in required positions will deliver water (minimum of 3 liter/minute through each nozzle) for 15 minutes for each of the suit orientations specified. Any evidence of wetness on the inner garment constitutes a failure.

2. Chemical Permeation Resistance Test

This test measures the permeation resistance of the suit material for 3 hours against each chemical in the NFPA battery of chemicals, and any additional chemicals or mixtures. Permeation resistance will be measured in accordance with ASTM F 739, *Test Method for Resistance of Protective Clothing Materials to Permeation by Liquids and Gases*, at 77^{o}F. The minimum detectable permeation rate will be less than or equal to 0.14 ug/cm'/min for all permeation resistance tests. In the permeation test apparatus, the protective clothing material specimen partitions the test chemical from the collection medium. The collection medium, which may be liquid or gas, is analyzed quantitatively for its concentration of the chemical and thereby the amount of that chemical that has permeated the barrier.

3. Flammability Resistance Test

All tests samples will be conditioned for not less than four hours in standard atmospheric conditions and will be tested not more than 5 minutes after removal from conditioning. Specimens will consist of at least 10 material samples and will be folded. A stopwatch will be started and the tip of the f lame will

be applied to the end until it is ignited, but no longer than 3 seconds. If specimen fails to ignite in 3 seconds, then reapply flame for an additional 12 seconds. Different results are then noted.

4. Abrasion Resistance Test

This testing will be conducted IAW ASTM D 4157, *Test Method for Abrasion Resistance of Textile Fabrics*. The specimen will be abraded for 25 continuous cycles. The permeation test specimen will be taken from the exact center of the abraded sample. Permeation resistance testing will be substituted for abrasion to rupture and percentage loss in breaking load for interpreting abrasion resistance test results.

5. Cold Temperature Performance Test

Cold temperature performance will be measured in accordance with ASTIM D 1043, *Test Method for Stiffness Properties of Plastics as a Function of Temperature by Means of a Torsion Test.* The modulus of rigidity will be measured over the range of test temperature and specifically reported at -13^{o}F.

6. Penetration Resistance Test

Penetration resistance testing of suit closure assemblies will be conducted IAW ASTM F 903. A minimum of three suit closure assemblies will be tested for each of the NFPA battery of chemicals. The suit closure will be preconditioned by 50 cycles of completely opening and completely closing the closure assembly. The suit closure to be tested will be contacted with test chemicals (5 minutes at P_{atm} 1 minute at 2 psig, and 54 minutes at P_{atm}). The test cell will be modified to accommodate the shape of the suit closure assembly. observed or detected liquid penetration at one hour or less will constitute failure of this test.

7. Exhaust Valve Inward Leakage Test

Suit exhaust valves will be conditioned at 901F at a relative humidity of 50% for a minimum period of 4 hours. Valves will be tested not more than 5 minutes after removal from conditioning. With the exhaust valve mounted in the test fixture, a suction of 1.0 inch water gauge pressure will be applied to the side of the valve *representing the* suit interior for 30 seconds while the flow rate into the valve is measured.

8. Exhaust Valve Cracking Pressure Test

Cracking pressure will be measured for a minimum of 12 samples suit exhaust valves that have been conditioned as above. With the exhaust valve mounted in the test fixture the static pressure and the valve interior will be systematically increased while the flow rate out of the valve is measured. Pressure will be increased until a flow rate of 6.10 in3/min is measured.

9. Luminous Transmittance Testing

Luminous (visible) transmittance will be measured IAW ASTM 0 1003. Luminous transmittance will be determined by measuring the spectral transmittance and calculating the luminous transmittance through the use of published data on special radiant energy and the relative luminous efficiency of the average eye.

B. Swatch Tests

Swatch /components from worn suits will be tested for penetration resistance against liquid challenges of HD, GB, VX, L (and DS2) at a challenge density of 12 g/m^2. Ten worn suits will be randomly selected and dedicated to testing with each agent. Two swatches/components will be taken from each suit at locations listed below except for the pass-thru for which only one per suit is available. All swatches will be tested IAW closed-cup test methods for nonporous materials of TOP 8-2-501 for 4 hours at a temperature of 90 DEG F. In addition, two swatches of control fabric will be included in every trial. These swatches will also provide baseline data for fabric in new condition.

Sampling Locations:

Swatch	Component
Knee	Glove/Cuff
Elbow	Pass-thru
Seat	Tether Air Supply Hose
Back	Coolant Hose
Shoulder	Zipper
Visor	Exhaust Valve
Visor/Garment	
Garment/Garment	

C. OSHA 1910-120, App. A -

1. Totally-Encapsulating Chemical Protective Suit Pressure Test

This test measures the ability of a gas tight totally-encapsulating chemical protective suit material, seams, and closures to maintain a fixed positive pressure. The suit is visually inspected and modified for the test. The test apparatus is attached to the suit to permit inflation to the pre-test suit expansion pressure for removal of suit wrinkles and creases. The pressure is lowered to the test pressure and monitored for three minutes.

2. Totally-Encapsulating Chemical Protective Suit Qualitative Leak Test

This test semi-qualitatively tests gas tight suit integrity by detecting inward leakage of ammonia vapor. Since no modifications are made to the suit to carry out this test, the results from this practice provide a realistic test for the integrity of the entire suit. The volume of concentrated aqueous ammonia solution required is calculated based on the size of test area, etc. The suit is donned by a person wearing respiratory equipment. The ammonia solution is poured into an open pan and a 2-minute evaporation

period is observed before the test room concentration is measured. When the concentration is between 1000 and 1200 ppm, the individual starts a standardized exercise protocol to stress and flex the suit. After completing the protocol, the room concentrations is measured again. The individual exits the room and the ammonia concentration is measured inside the suit. The intrusion coefficient of the suit can be calculated by dividing the average test area concentration by the interior suit concentration.

D. Reuse After Vapor Contamination

This test demonstrates whether the suit can be decontaminated and reused after exposure to chemical agent vapor. The testing will be done with GB, HD, VX, and Lewisite. A total of 30 suits will be tested. The worn suits are placed on manikins for exposure to agent for 4 hours and at concentrations determined by the D2PC. The suits will be deconned, bagged for at least 4 hours and the bag will be tested to verify the vapor concentrations are below the permissible levels. They will be worn for one additional wear mission, undergo visual inspection and pressure checks, and then be sampled for liquid agent swatch testing (testing will be done with same agents and scheme as B).

E. Man-In-Simulant

MIST is done with one simulant TBO and at concentrations determined and will be equivalent to the maximum credible HD event for a ventilated igloo scenario. A total of 20 suits - 10 new and 10 worn. Worn suits will be those that have accrued 4 wear missions. Simulant concentration inside the suit will be monitored at a maximum of 3 locations. Sequential sampling of locations will be used to minimize effect on the air volume being monitored. As a minimum, activity will consist of a set of repetitive exercises for a period of 4 hours. For each suit tested, concentration readings over the 4 hour monitoring period will be used to calculate a TWA concentration at each sample location. Statistical analysis will follow to determine probability of occurence and expected magnitudes for each agent of interest if any penetrations are detected.

OTHER CONSIDERATIONS:

Electromagnetic

This test measures radiated emissions of the systems components IAW MIL-STD-462. Components of interest for this test include the microclimatic cooling system and the emergency breathing apparatus. The test also includes observing degradation in electronic equipment/radio communications during testing which is indicative of excessive electromagnetic emissions.

Hot and Cold

Consideration should be given as to whether the system is designed and constructed for use in a site determined temperature range.

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MAN-IN-SIMULANT TEST SITES

Dugway Proving Ground
Edgewood Research Development
and Engineering Center
Battelle

INSTRUCTIONS FOR USING PROTECTIVE CLOTHING TEST MATRIX

The enclosed information provides each installation with the test requirements that commercial protective clothing must undergo before obtaining Department of Army Safety approval for use. DA Safety approval will be based on the results of the testing as well as whether the suit meets the site specific “use scenario”. The "use scenario" will be composed of information describing how the clothing will be used i.e., in chemical agent igloos containing unknowns, in flammable areas, for excavations, with chemical agents and reusable/non-reusable.

All commercial protective clothing must be tested against the five major test areas unless DA Safety has approved a deviation from this requirement. An example of this might be that an installation plans on disposing of used suits thereby negating the need to perform the decontaminability test. The desire to dispose of all suits would have to be contained in the "use scenario". A1so, the failure of a suit to pass a particular test does not mean that the suit can not be used. For example, if a suit fails the decontaminability test then the DA Safety approval would be contingent upon disposing of all used suits.

Each installation will be responsible for obtaining all maintenance support i.e., logistic, training. It is recommended that this type of support be made part of the purchase contract with the commercial protective clothing manufacturer. Innovative approaches, such as two installations purchasing the same suit and sharing maintenance support, are encouraged.

Approval Process:

Each installation will forward all test data and the "use scenario" to DA Safety for approval. The DA Safety will forward the request to the CASHPAC which has a working group established to review the submitted information. The working group will provide a recommendation to the CASHFAC for forwarding to DA Safety. The DA Safety will then coordinate the recommendation with the Office of The Surgeon General and the Deputy Chief of Staff for Operations before providing approval/ disapproval to the installation. The U.S. Army Technical Center for Explosive Safety will be the repository for all submitted information.

Required Information:

1. Each installation will prepare and submit a “use scenario.” This scenario-should be detailed enough so that the reviewers can ascertain whether any requested deviations from testing can be approved. A detailed scenario also allows each installation to chose a suit that meets their requirements and offers flexibility in the test arena.

2. All test results (raw data) will be submitted as well as a statement that there were no deviations in the manner in which the tests were conducted.

3. A technical point of contact that can answer questions regarding the installation/activities request will be provided.

USAMC CHEMICAL AGENT SAFETY & HEALTH POLICY ACTION COMAITTEE (CASHPAC)

EPA LEVEL B PROTECTIVE CLOTHING TEST CRITERIA

JANUARY 1998

COMMERCIAL CHEMICAL PROTECTIVE CLOTHING TEST CRITERIA

Commercial chemical protective clothing must be tested against the following mandatory requirements:

Liquid challenge/Vapor Penetration Test
Aerosol Test
Decontaminability Test

The choice of appropriate chemical protective clothing is based on many factors to include the "use scenario". A detailed description of how and where the clothing will be worn must first be developed prior to determining the extent of testing. The clothing will then be tested against the requirements. Users should consider all potential uses and ensure that the chosen Level B clothing is compatible. For instance, if the use scenario requires suit contact with sharp objects (digging or crawling in dirt), then the user should be able to demonstrate via test data that the suit material will stand up to this type of use. Some of the mandatory tests may be optional depending on the scenario , i.e., if clothing will not be reused when decontaminability/reuse testing may not be required.

Test Descriptions:

Chemical Agent Protection -

Swatch Tests - TOP 8-2-501 (modified)
Liquid Challenge/Vapor Penetration
(using appropriate chemical agent at the required protection level)

Decontaminability

Aerosol Test

Other Considerations: These areas must be addressed and information or data provided.

Suit Reuse

Material Strength - Resistance to abrasion, tearing, or ripping

Microclimatic Cooling (does heat stress management provided meet mission)

Environment -
Electromagnetic – MIL-STD-461
Hot and Cold - (Range of 0 to 100^{o} F)

Human Factors -
Donned/doffed with one assistant

Compatibility with MHE, tools, equipment
Anthropometric data
Compatible with existing communications equipment

Breathing Capability -
NIOSH certified

Flammability Resistance

Detailed Description of Tests:

A. Liquid Challenge/Vapor Penetration

This testing is conducted to measure the actual permeation of chemical agents (agent type is determined from the use scenario) through $watches taken from the suits. As a minimum. through swatches are taken from six different areas of the suit. Each swatch is placed in a test cell (MIX material swatches per test cell and one control swatch) and is exposed to a predetermined liquid agent challenge (based on the use scenario) that is applied to the top surface of the swatch. The sampling times (hours) and intervals (minutes) are determined based on the protection requirement resulting from the use scenario(s). A sample is sequentially drawn from the air flowing below each swatch by a MINICAMS which determines the amount of agent vapor that has penetrated the swatch. With these measurements and knowing the area of the test swatches, it is possible to determine the nanograms per square centimeter (ng/=2) that permeate each swatch over time (hours), The test methodology can be found in Appendix A. Swatch te3ting of suit components ouch as the glove/ cuff and zipper/ suit interface, exhaust valve, or any other material penetrations or interfaces should be performed.

Example Sampling Locations:

Swatch
Knee
Elbow
Seat
Back
Garment/Garment

B. Decontaminability Test

This test will demonstrate that the suit. can be decontaminated and disposed of in a safe marine.-. The use 3cenario will determine which agents and vapor contamination requirements are appropriate. The suit is placed on a mannequin for exposure to agent (at the required vapor contamination) and at concentrations determined by the use scenario. The suit will be decontaminated, bagged for at least 4

hours and the atmosphere inside the bag will be tested to verify the vapor concentrations are below the permissible levels.

C. Aerosol Test

Aerosol testing is done using corn-oil as the simulant to measure any leakage into the suit. In order to properly test suits with statistical significance, 8 suit ensembles will be used. The suit ensembles must include all relevant accessory equipment - gloves, boots, etc. Simulant concentration inside the suit will be sampled at two locations: neck and upper arm. As a minimum, activity will consist of a set of repetitive exercises which mimic user movements. A description of the test and suggested movements made by personnel during the test are *shown in* Appendix B.

Other Considerations

A. Material Strength

Data should be provided that demonstrates that the material has some resistance to tears, rips, or abrasion. ASTM D 4157*, Test Method for Abrasion Resistance of Textile Fabrics* is a good test to determine this resistance.

B. Suit Reuse

This test demonstrates whether the suit can be decontaminated, laundered, and reused after exposure to chemical agent vapor. The use scenario will determine which agents and vapor contamination requirements are appropriate. The suit is placed on a mannequin for exposure to agent (at the required vapor contamination) and at concentrations determined by the use scenario. The suit will be decontaminated, bagged for at least 4 hours and the atmosphere inside the bag will be tested to verify the vapor concentrations are below the permissible levels. The suit %ill then be laundered. This process will be continued for a specified number of cycles as determined by the user. Swatch testing in accordance with A above will be performed using worn and/or abraided material from the suit.

The remaining topics in this section, if applicable, will be discussed in. the submission.

APPENDIX A

This test procedure was adapted from the 'Semipermeable and Impermeable Materials Static Diffusion Penetration Testing (Liquid Agent Challenge/Vapor Penetration, AP = 0, Single Flow Teat) given in Test Operating Procedure 8-250 1 (Draft) dated 3 March 1997.

The following procedure will be used:

1. Upon receipt of a suit, all available information concerning the suit will be recorded; date of manufacture, lot number, 3eiial number, materials of construction, etc.

2. From each suit, 3 ea. 1 and 15/16 inch diameter material swatches will be taken for each chemical agent tested. Depending upon the suit configuration, 3 ea. = swatches (same diameter) will be taken plus triplicate swatches of other flat components such as other seams, visor, gloves, booties, etc. for each chemical agent tested. Each swatch Will be placed in an airtight bag and given a unique serial number that will be placed an the bag. A list of serial numbers will be kept with the swatches.

3. The environmental chamber will be controlled at a temperature of 90 +/- 2° F and the maximum achievable relative humidity without occurrence of condensation (70% +/- 10% RH). The temperature and RH readings will be checked weekly with a calibrated meter. The test cell air will be drawn from the chamber air. There will be no system control and data acquisition system. The temperature and RH will be recorded M- a computer file. Mow rates will be manually recorded. There will be no differential pressure monitoring since differential pressure gages of sufficient sensitivity are not available.

4. The TOP test cell will be used. When assembling, the cell lugs will be tightened by hand to finger tight. The flow rate beneath each swatch will be 1 liter/minute which will be controlled by a linear mass flow controller. The flows will be checked with a calibrated test meter weekly. Each test cell will be checked for leaks after assembly by connecting it to the vacuum source and checking that the inlet flow is the same as the outlet flow on the mass flow controller (cell lugs will be retightened if flows do not match).

5. The samples will serve as their own negative controls while being preconditioned overnight by being MINICAMS monitored. Eighty mil silicone will be used as a positive control for each test (6suit swatches and 1 silicone swatch).

6. Based on the use scenario appropriate test chemical agents and the contamination density (g/m2) will be chosen. The chemical agent will be applied (1 liter chemical agent droplets) using the click/touch method with a Hamilton repeating dispenser.

7. Seven swatches will be tested at once. MINICAMS with stream selection system will monitor vapor penetration with a 3-minute cycle. There will be 3 blank sampling intervals following the control. Each swatch will be sampled once every 30 minutes. The MINICAMS will be standardized weekly.

8. The test length will be the time (hours) required for the protection.

9. The test cells and o-rings will be aerated between uses. No other cleaning method will be used.

10. The data to be reported are cumulative penetration (ng/cm^2) versus elapsed time (minutes) for each swatch. The elapsed time will either be the actual elapsed time or an average elapsed time (the sum of the elapsed time for swatch 1 and t he lapsed time for swatch 6 divided by 2).

APPENDIX B

In order to properly test suits with statistical significance, 8 suit ensembles should be used. The suit ensembles included relevant accessory equipment such respirators that will be worn with the suits, gloves, and any other equipment that is necessary for chemical agent use. The suit ensembles should be run on at least 10 different subjects with 22 trials. Sampling of suits should be in the neck and upper arm region.

The exercise routine for all suits should include some of the exercises below as well as exercises modeled after the various use scenarios;

Phase 1.

1) standing still, normal breathing
2) bending forward and touching toes
3) jogging in place
4) raising arms above head and looking upward
5) bending knees and squatting
6) crawling on hands and knees
7) torso twists with hands folded on chest
8) standing still, -normal breathing

Phase 2:

1) climb stop ladder
2) move 3 lb. boxes from table to floor
3) rest
4) roll walls and ceiling with paint roller
5) bag clothes
6) rest
7) loosen bolts
8) move 3 lb. boxes from table to floor

NOTE: The Phase I exercises will be performed for 1 minute each for a total of 8 minutes. The Phase 2 exercises will be performed for 4 minutes each for a total of 40 minutes.